



## **WATER RESOURCES RESEARCH GRANT PROPOSAL**

**Project ID:** 2005PA42B

**Title:** Source Water Protection from Infectious *Cryptosporidium* spp. Oocysts

**Project Type:** Research

**Focus Categories:** Water Quality, Water Supply, Surface Water

**Keywords:** *Cryptosporidium*, Wissahickon Creek, Monoshone Creek, Valley Road Tributary, Philadelphia Water Department, phylogenetic analysis, cell culture infectivity, pathogens, source water protection

**Start Date:** 03/01/2005

**End Date:** 02/28/2006

**Federal Funds:** \$18,000

**Non-Federal Matching Funds:** \$36,054

**Congressional District:** 15th

**Principal Investigator:**

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### **Abstract**

*Cryptosporidium* spp. cause an acute gastrointestinal disease that is self-limiting in otherwise healthy adults but can be prolonged and life-threatening for individuals with weakened or compromised immune systems. *Cryptosporidium* spp. are a challenge to drinking water treatment plants because (i) their environmental form, the oocyst, is extremely hardy and resistant to chlorine disinfection and (ii) the small size of the oocysts (4-8  $\mu\text{m}$  diameter) makes them difficult to effectively filter from water supplies. Given these challenges, watershed management to prevent source water contamination is a practical and necessary approach to preventing waterborne cryptosporidiosis. Effective watershed management requires knowledge of (i) the species of oocysts present in the surface waters, (ii) the viability or infectivity of these oocysts, and (iii) the watershed sources of oocysts with the largest impact on surface water contamination.

*Cryptosporidium* spp. have been detected in the Wissahickon watershed in southeastern Pennsylvania. Wissahickon Creek is a major tributary to the Schuylkill River, draining about 64 square miles of lower Montgomery and northwest Philadelphia counties before emptying into the Schuylkill River just upstream of the Philadelphia Water Department's

(PWD) Queen Lane Water Treatment Plant (WTP) intake. Two tributaries to Wissahickon Creek, Monoshone Creek and Valley Rd. Tributary, are on the PA 303(d) list due to pathogen impairments. These two tributaries flow through the lowest portion of the Wissahickon watershed and are among the last 3 tributaries to feed into Wissahickon Creek before Wissahickon Creek empties into the Schuylkill River; thus, the pathogen-impaired Monoshone Creek and Valley Rd. Tributary are likely to have significant impacts on water quality at the Queen Lane WTP intake.

The goal of this work is to identify the sources, species, and infectivity of *Cryptosporidium* oocysts in the Wissahickon watershed. This information will be important to minimize the potential for waterborne outbreaks of cryptosporidiosis in the City of Philadelphia. Specific aims of the project include:

1. Monthly collection of surface water samples in the Wissahickon watershed to identify (i) temporal or climatic patterns of oocyst contamination, (ii) the species of oocysts detected, and (iii) the infectivity of oocysts detected
2. Monthly collection of samples from potential oocyst hosts (e.g., deer, cattle, and bird droppings) and inputs (e.g., storm drain and sewer overflow effluents) in the Wissahickon watershed to identify (i) temporal patterns of oocyst shedding/inputs, (ii) the species of oocysts shed/input, and (iii) the infectivity of oocysts shed/input
3. Phylogenetic analysis of oocysts recovered from the surface water and oocysts recovered from watershed hosts/inputs to identify those watershed sources with the largest impact on surface water contamination